

What is claimed is:

1. A bone marrow sampling device, comprising:

an outer cannula having a sidewall defining an inner lumen and a closed distal end with a tissue penetrating tip, the sidewall having a plurality of openings formed therein and spaced apart at different radial and longitudinal positions on the sidewall, wherein each opening is in fluid communication with the inner lumen of the outer cannula;

an inner cannula having a sidewall defining an inner lumen, the inner cannula being adapted to be disposed within and mated to the outer cannula such that the outer cannula and inner cannula are selectively moveable with respect to each other; and

at least one opening formed in the sidewall of the inner cannula, wherein selective relative movement of the inner cannula and the outer cannula enables the device to be configured in multiple bone marrow sampling modes in which the at least one opening in the sidewall of the inner cannula is aligned with different openings in the sidewall of the outer cannula such that bone marrow can be drawn into the inner lumen of the inner cannula from different radial and longitudinal positions external to the sidewall of the outer cannula without the need to reposition the outer cannula.

2. The bone marrow sampling device of claim 1, wherein an alignment of the at least one opening in the inner cannula with one of the openings in the outer cannula creates a withdrawal aperture with a diameter in the range of about 0.5 mm to 3 mm.

3. The bone marrow sampling device of claim 1, wherein an alignment of the at least one opening in the inner cannula with one of the openings in the outer cannula creates a withdrawal aperture with an open surface area in the range of about 0.5 mm² to 8 mm².

4. The bone marrow sampling device of claim 1, wherein the outer cannula has a diameter in the range of about 0.7 mm to 6 mm.

5. The bone marrow sampling device of claim 1, wherein the inner cannula has a closed distal end.

6. The bone marrow sampling device of claim 1, wherein the inner cannula has a plurality of openings in the sidewall, each opening being spaced apart at different radial and longitudinal positions on the sidewall.

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7. The bone marrow sampling device of claim 1, wherein the minimum distance between the openings in the sidewall of the outer cannula is at least about 5 mm.

8. The bone marrow sampling device of claim 1, wherein the selective relative movement
10 between the inner cannula and the outer cannula is rotational movement.

9. The bone marrow sampling device of claim 1, wherein the selective relative movement between the inner cannula and the outer cannula is translational movement.

15 10. The bone marrow sampling device of claim 1, wherein the selective relative movement between the inner cannula and the outer cannula is a combination of rotational and translational movement.

11. The bone marrow sampling device of claim 1, wherein a proximal end of the inner
20 cannula is adapted to mate with a suction device.

12. The bone marrow sampling device of claim 1, further comprising a second inner cannula disposed between the inner cannula and the outer cannula.

25 13. The bone marrow sampling device of claim 12, wherein the second inner cannula has a solid outer sidewall that is free of openings in the sidewall.

14. The bone marrow sampling device of claim 13, wherein the second inner cannula is selectively movable with respect to the inner cannula and the outer cannula, such that the
30 selective movement of the second inner cannula blocks or opens at least one withdrawal aperture

created between the inner cannula and the outer cannula by an alignment of the at least one opening in the inner cannula with one of the openings in the outer cannula.

5 15. The bone marrow sampling device of claim 12, wherein the second inner cannula has a channel formed in its outer sidewall, wherein the channel provides a passage for the deliver of a treatment material.

10 16. The bone marrow sampling device of claim 1, wherein the selective relative movement between the inner and outer cannula is automated.

17. The bone marrow sampling device of claim 1, wherein the openings formed in the outer cannula sidewall follow a helical pattern.

15 18. The bone marrow sampling device of claim 1, further comprising indicia formed on the inner cannula and the outer cannula to provide an indication when the at least one opening on the inner cannula lines up with one of the openings of the outer cannula to create a withdrawal aperture.